ABUNDANCE AND DISTRIBUTION OF MUSKOXEN NEAR ARTILLERY LAKE, NWT, MARCH 1989

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DEPARTMENT OF RENEWABLE RESOURCES

GOVERNMENT OF THE NORTHWEST TERRITORIES

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Northwest Territories Renewable Resources

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ABSTRACT

Muskoxen have been increasing in numbers in the Artillery Lake area north-east of Great Slave Lake. The community of Snowdrift has requested that it be granted a muskox quota. To evaluate the size of a sustainable harvest, we did a stratified transect survey in 34,400 km^2 of the community's traditional hunting area. We estimated 563 ± 154 (SE) muskoxen and a density of 0.03/km^2. Mean herd size was 27. We observed 16 wolves in the study area.

Because of the low density of muskoxen, the large number of wolves, and benefits from further re-colonization, we recommend a conservative harvest of no more than 14 animals (2.5% of the estimate). We also suggest that consideration be given to providing protection to portions of the area to allow population numbers to increase. Further studies should be done to obtain a more precise population estimate, to evaluate the age-sex composition of the population and the harvest, and to collect local knowledge on wolf distribution and behaviour.

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INTRODUCTION

In the late 19th century, muskoxen (Ovibos moschatus) almost disappeared between Great Slave Lake and the Thelon River (Figure 1) through a probable combination of over-hunting for the hide market and unfavourable weather conditions (Barr 1989). However, the valley of the Thelon River itself maintained a remnant muskox population and thus was declared a Game Sanctuary by the federal government in 1917 to assist in the recovery of Northwest Territories mainland muskoxen herds. In recent years, local hunters and trappers and other travellers in the area have reported seeing increasing numbers of muskoxen in the Hanbury River and Artillery Lake areas (Figure 1) (Don Thomas, Robert Decker, Mark Williams, Noel Drybones; pers. comm.). On the basis of these sightings, hunters from Snowdrift and Fort Reliance have requested a muskox quota. In response to that request, we conducted a survey in March 1989 to obtain an estimate of the muskox population and to determine its current distribution.

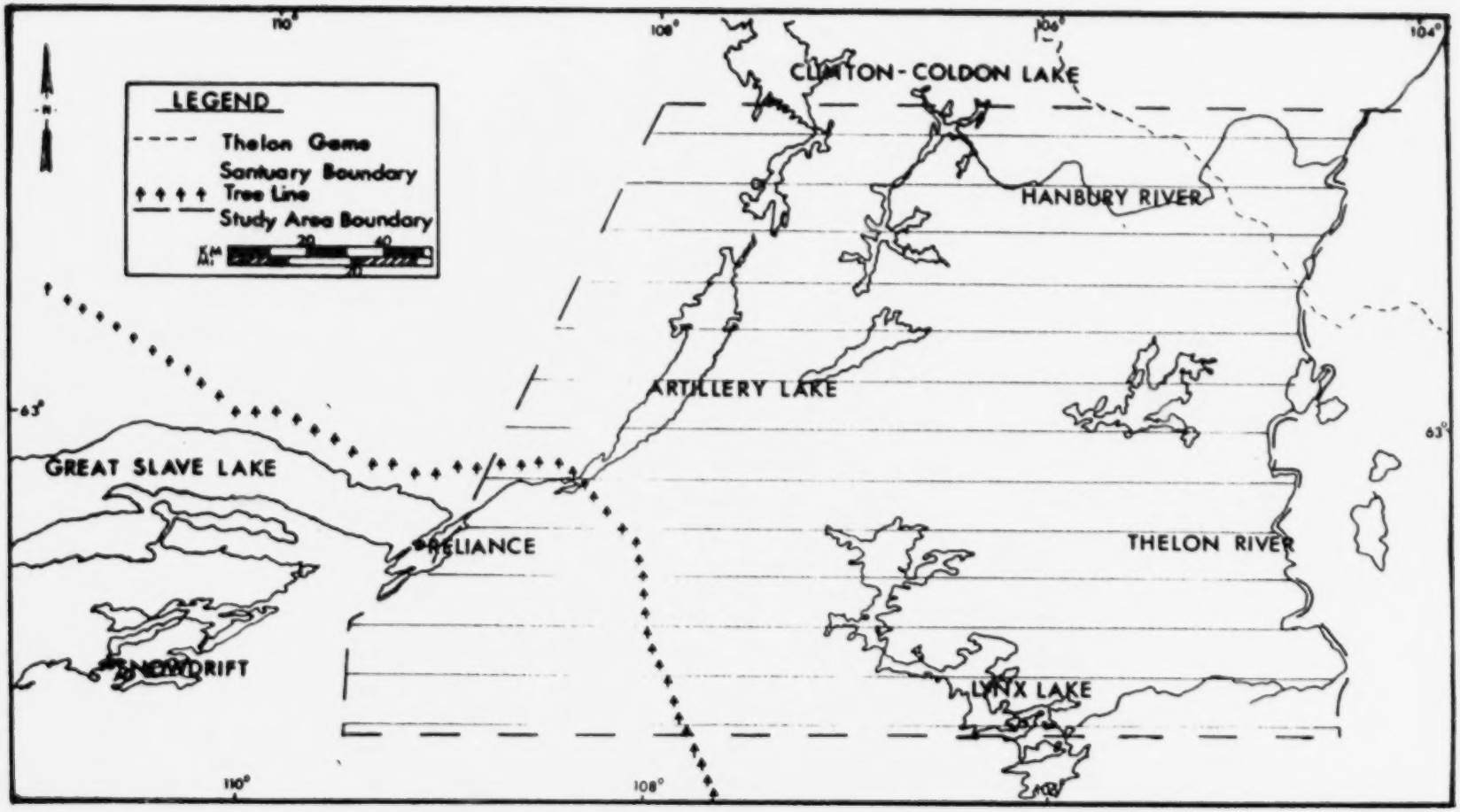

Figure 1. Map of the Artillery Lake study area showing reconnaissance lines flown in March 1989.

STUDY AREA

The study area was defined to coincide largely with the area in which Snowdrift residents might hunt muskoxen. Hunting areas were determined through discussion with local hunters.

The study area extended from Clinton-Colden Lake south to Lynx Lake and from the east arm of Great Slave Lake east to the Thelon River (Figure 1). This area comprises 34,407 km^2 and is entirely tundra excepting the forested south-eastern portion and islands of trees along the Thelon River.

METHODS

The survey was conducted using a Cessna 337 twin-engine, fixed-wing aircraft chartered from Landa Aviation of Hay River. The aircraft was flown at an altitude of 185 m above ground level and at an airspeed of 225 kph. Transect widths were 1 km on each side of the aircraft. Consistent and accurate strip widths were ensured by using taped dowlings attached to the wing struts. We verified accuracy of strip width by flying over ground markers measured as being exactly 1 km apart. Strip width was re-checked several times during the survey.

We initially flew a reconnaissance using transect lines 12.5 km apart (16% of the area) to determine the relative densities of muskoxen in the survey area (Figure 1). High and low density areas were defined (Figure 2). In the high density stratum we flew transects 4 km apart and thus provided a coverage of 50%. Our estimate for the low density area was calculated using the data from the reconnaissance flights. Groups of muskoxen larger than ten animals were photographed several times and the estimated number in the group verified later from the photographs. The estimates were calculated using Jolly's Method 2 for unequal sample sizes (Jolly 1969) on a computer program prepared by our Department.

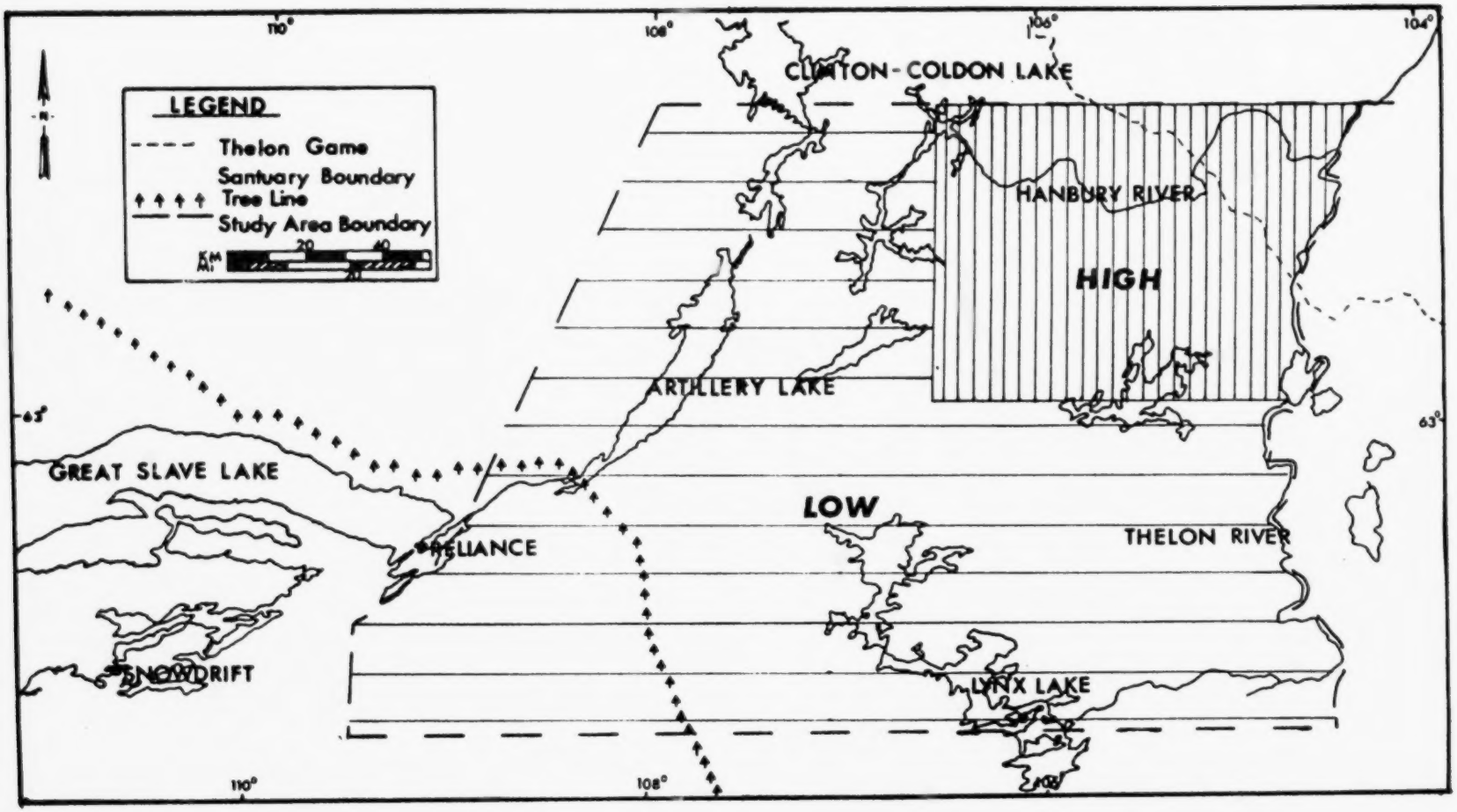

Figure 2. Transect lines in the high and low density areas of the Artillery Lake study area flown in March 1989.

RESULTS

A total of 43 hours was flown including ferry time from Hay River. Snowdrift was on average about 45 minutes from the survey area. The actual survey required eight days of flying between March 20 and March 31, 1989. We lost two days to bad weather and two days to mechanical problems. The temperature fluctuated between -15° and -42° degrees Celsius. Flying days were clear except for March 31 which was foggy for most of the day.

We counted 131 muskoxen on transect in the high density area and 46 on transect in the low density area (Appendix A). This resulted in an estimate of 304 in for a total of 563 $\pm$ 154 S.E. in the 34,407 km^2 study area (Table 1). The Coefficient of Variation (CV) was 0.27. We were unable to distinguish calves consistently (actually short-yearlings at this time of the year) because of their relatively large size and, therefore, have included them in the estimate. The mean herd size was 26.6 $\pm$ 23.0 S.D. with a range of 3-95, based on 18 groups on and off transect (Appendix A). We did not see any single muskoxen.

We also observed 16 wolves (Canis lupus) and six moose (Alces alces), including one calf. We found barren-ground caribou (Rangifer tarandus groenlandicus) in both the treed and tundra portions of the study

area. The wolves were always within 10 km of groups of caribou.

TABLE 1. Analysis of data from the stratified transect survey for muskoxen in the Artillery Lake area, March 1989.

Study area (km^2)	34,407
Low density stratum (I) area (km^2)	26,737
High density stratum (II) area (km^2)	7,670
Area surveyed (km^2) - in I	4,049
- in II	3,873
Population estimate	563
Population variance	23,657
Population Standard Error	154
Coefficient of Variation	0.27
95% Confidence Interval	$\pm$302
Muskox densities (muskox per km^2)	
- total study area	0.016
- Stratum I (low density)	0.011
- Stratum II (high density)	0.034

DISCUSSION

Visibility of the animals was good throughout the survey, but lack of topographical features made navigation difficult. We are confident that our estimate of 563 ± 154 S.E. is reasonably accurate and certainly not an over-estimate. The 300 muskoxen observed both on and off transect in the high density area is higher than our estimate of 259 based on a coverage of 50% (Appendix A). Even in the low density stratum with a coverage of only 16%, plus ferry flights, we saw 59% (178/304) of the animals estimated to be in the area. By seeing so many muskoxen off transect, the range of our estimate narrows and we can be 95% confident that the true population number lies between the 478 seen off and on transect and 865 (563+[1.96 x SE]).

Although we have confidence in the accuracy of the estimate, the precision of the estimate (CV=0.27) does not meet suggested standards (Graf and Case, in press). This lack of precision results more from the large group sizes encountered than from the number of transects flown.

The mean group size of 26.6 ± 23.0 S.D. is larger than has been reported in previous winter surveys in

the Northwest Territories (Table 2). We speculate that the large muskox groupings were a response to the many wolves in the area. These wolves all seemed to be associated with caribou. The study area is inundated each winter by caribou, usually from the Beverly herd but sometimes animals from the Bathurst herd as well. Presumably the caribou would be accompanied by wolves. Between 5 and 160 wolves were harvested each year from Snowdrift and Fort Reliance between 1971 and 1987 (Department of Renewable Resources unpublished files). We have no data to indicate whether or not wolves remain in this area of the tundra year round, although it seems likely. There are many eskers running through the area which may provide suitable denning habitat. Caribou pass through the area each spring and fall during their round trip to their calving ground to the northeast.

Table 2. Herd characteristics of some muskoxen populations during the winter in the Northwest Territories.

SURVEY AREA	DATE OF SURVEY	GROUP SIZE (RANGE)	DENSITY (# MUSK. PER KM^2)	SOURCE
Victoria Island	March 1983	10.5±5.5 S.D. (2-27)	0.08	Jingfors 1984
North Great Bear	March 1983	21.1±2.7 S.E. (1-85)	0.03	Case & Poole 1985
Central Keewatin	November 1985	19.8±23.0 S.D. (2-68)	0.06	Case & Graf 1986
Artillery Lake	March 1989	26.6±23.0 S.D. (3-95)	0.02	This study

The Department held a workshop in 1983 on muskox population characteristics. It was agreed by participants that the maximum allowable harvest of muskoxen should be 3% of the population estimate. This percentage was considered conservative as we did not, and still do not, have sufficient data on age structure and age-specific mortality rates from any population to consider a higher rate of harvest. Other factors to be considered in determining an allowable harvest rate for the Artillery Lake population are the following:

1. A desire to see further range expansion and greater population density-- Muskoxen have been dispersing south and southwest from the Thelon River and Back River areas to colonize the current study area. There is still room for further colonization to the tree line south of Lynx Lake and to the tree line west of MacKay and Courageous lakes. An increasing core population is required to have dispersal occurring and while this population is almost surely increasing it is still a sparse, relatively low density population (0.03 muskoxen per km^2) when compared to the Queen Maud Gulf population at 0.17 muskoxen per km^2 (Gunn and Case 1984) or the Banks Island population at 0.37 muskoxen per km^2 (McLean et al. 1986).

2. The effect of high predator numbers-- Heavy predation obviously prevents a core population from increasing at a maximal rate. In this study area we observed many wolves, but we do not know if this is a seasonal or year-round occurrence. We would expect to see barren-ground grizzly bears (Ursus arctos) in the area which could further increase the rate of natural mortality (Gunn

and Miller 1982; Case pers. comm.).

3. Calf ratios and recruitment rates-- We have no good data on these important parameters although we observed some short-yearlings in the groups. Predation pressure is expected to impact most heavily upon calf survival.

4. Likelihood of catastrophes-- It is unlikely that weather-related catastrophes such as mid-winter thaws would influence a mainland population with the frequency and impact that they seem to affect high arctic island muskoxen (Miller et al. 1977).

We suggest that, until further studies have been completed, the maximal harvest for the area surveyed be set no higher than 2.5% of the estimate; that is, at 14 animals. This is a conservative quota which will allow modest population increase and compensation for possibly low recruitment rates resulting from heavy predation. We further suggest that the community consider innovative means for allowing population increase and dispersal thereby enhancing opportunities for the next generation of hunters.

This will be the first opportunity for a Dene/Metis community to hunt muskoxen since the federal legislation of 1917. Allocation of tags will require

further community consultation as the Dene/Metis Comprehensive Land Claim Agreement in Principle, Section 13.5.12, indicates that a portion of muskox quotas in the Claim area shall be granted to resident non-participants. Discussions regarding a hunting season to ensure that muskoxen are not disturbed during the calving season (April and May) should also take place.

RECOMMENDATIONS

1. To undertake discussions with the community wildlife committee to determine options for dispersal corridors, hunting seasons, sex restrictions and commercialization of the hunt.
2. To establish a quota of as many as 14 muskoxen from the Artillery Lake population for the communities of Snowdrift and Fort Reliance, with some negotiated portion going to resident non-participants.
3. To undertake further studies including summer population and composition surveys, the collection of harvest data and the collection of local knowledge regarding seasonal densities of predators.

ACKNOWLEDGMENTS

We would like to thank Noel Drybones of Fort Reliance for accompanying us on the survey and contributing not only his good eyes, but also his extensive knowledge of the area. We would also like to thank Joe Lockhart Jr. for helping us on many occasions during our stay in Snowdrift. Many thanks to Peter Jackson and Larry Buckmaster, the pilots from Landa Aviation, for flying and navigating in some difficult situations. Many people have passed onto us their incidental sightings of muskoxen in this area over the years and we would like to thank them now, especially Don Thomas, Robert Decker, Mark Williams and Noel Drybones.

PERSONAL COMMUNICATIONS

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Thomas, Don. Research Scientist, Canadian Wildlife Service, Department of the Environment, Edmonton, Alberta.

Williams, Mark. Caribou Technician, Wildlife Management Division, Department of Renewable Resources, Government of the Northwest Territories, Yellowknife, NWT.

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APPENDIX A: Numbers of muskoxen observed in the Artillery Lake area in March 1989.

TRANSECT NUMBER	AREA (km^2)	MUSKOXEN ON TRANSECT	MUSKOXEN OFF TRANSECT
High Density Stratum			
1	160	0	10
2	160	0	0
3	160	10	60
4	160	0	48
5	160	0	0
6	160	0	0
7	160	0	0
8	160	9	0
9	160	0	0
10	160	39	0
11	160	0	0
12	160	0	0
13	160	8	11
14	160	35	0
15	160	0	0
16	160	0	0
17	160	0	0
18	160	0	0
19	160	0	0
20	160	0	0
21	160	0	40
22	158	3	0
23	141	27	0
24	87	0	0
25	67	0	0
26	60	0	0
Sub-total		131	169
Low Density Stratum			
1	135	0	0
2	140	0	0
3	140	6	0
4	143	0	0
5	145	0	0
6	145	0	0
7	306	0	95,13,24
8	308	0	0
9	392	28	0
10	423	0	0
11	458	0	0

12	489	12	0
13	491	0	0
14	208	0	0
15	126	0	0
Sub-total		46	132
TOTALS		177	301